

Listing of Claims

The listing of claims will replace all prior version, and listings, of claims in the application:

Claim 1: (Currently Amended) A method of ~~broadband access device~~ for controlling a DHCP relay in a broadcast access device ~~user~~ to implement control and management of interaction between a DHCP client and a DHCP server, ~~which comprises~~ comprising:

modifying, at the broadcast access device, one or more protocol fields in all of at least one DHCP messagesmessage interacted communicated between a DHCP relay₁ and the DHCP client and the DHCP server during an initiation phase of the DHCP interaction at an Application Layer of TCP/IP protocol, so that all of the at least one DHCP messagesmessage interacted communicated between the DHCP client and the DHCP server can pass through the DHCP relay₁,

wherein modifying the one or more protocol fields includes:

upon receiving a DHCP message for request sent from the DHCP client to the DHCP server, filling in at least one field associated with the DHCP relay in the DHCP message for request, and

upon receiving a DHCP message for response sent from the DHCP server to the DHCP client, replacing at least one server parameter of a field associated with the DHCP server in the DHCP message for response with at least one relay parameter of the DHCP relay.

Claim 2: (Currently Amended) The method of claim 1, wherein ~~the modifying further comprises the following steps:~~

~~Step 1, after receiving any DHCP messages for request sent from the DHCP client to the DHCP server, the DHCP relay filling in fields associated with the DHCP relay in the DHCP message for request, filling in the at least one field associated with the DHCP relay in the DHCP message for request is performed such~~ so that any a DHCP messagesmessage for response returned from the DHCP server to the DHCP client for responding to the DHCP message for request can pass through the DHCP relay, and;

~~Step 2, wherein modifying the one or more protocol fields further includes: after receiving a first DHCP message for response returned from the DHCP server to the DHCP client, the DHCP relay~~

extracting and storing, at the DHCP relay, DHCP server parameters the at least one server parameter of the fieldsfield associated with the DHCP server in the an firstinitial DHCP message for response and then prior to replacing the DHCP at least one server parametersparameter with DHCP relay parameters the at least one relay parameter of the DHCP relay₁; and

_____ sending the ~~first initial~~ DHCP message for response to the DHCP client;

~~Step 3, the relay _____ processing, at the DHCP relay, any a received subsequently received~~ DHCP ~~messagesmessage~~ for response returned from the DHCP server to the DHCP client;

_____ determining whether the ~~subsequently received~~ DHCP ~~messagesmessage~~ for response contains the ~~fieldsfield~~ associated with the DHCP sever,

_____ in response to determining that the ~~subsequently received~~ DHCP message for response does not contain the field associated with the DHCP server, ~~if not,~~ sending the ~~subsequently received~~ DHCP ~~messagesmessage~~ for response to the DHCP client directly,

_____ otherwise, replacing the ~~at least one~~ DHCP server ~~parametersparameter~~ in the ~~fieldsfield~~ associated with the DHCP server with the ~~at least one~~ DHCP relay ~~parametersparameter~~, and then sending the ~~subsequently received~~ DHCP ~~messagesmessage~~ for response to the DHCP client so that ~~any a subsequent~~ DHCP ~~messagesmessage~~ for request sent from the DHCP client to the DHCP server can pass through the DHCP relay;

~~Step 4, the DHCP relay _____ processingreceiving, at the DHCP relay, the subsequent DHCP~~ ~~messagesmessage~~ for request,

_____ determining whether the subsequent DHCP ~~messagesmessage~~ for request ~~containsincludes~~ the ~~fieldsfield~~ associated with the DHCP sever,

_____ in response to determining that the subsequent DHCP message for request does not include the field associated with the DHCP server~~if no~~, sending the subsequent ~~data packet~~ DHCP message for request to the DHCP server directly,

_____ otherwise, filling in the ~~fieldsfield~~ associated with the DHCP server with the ~~extracted and stored at least one~~ DHCP server parameter ~~stored in Step 2, and then~~ sending the subsequent DHCP ~~messagesmessage~~ for request to the DHCP server so that ~~any one or more other~~ subsequent DHCP messages for request can pass validity checking by the DHCP server.

Claim 3: (Currently Amended) The method of claim 2, further comprising:

~~Step 5, the DHCP relay _____ controlling and managing, at the DHCP relay, the interaction between the DHCP client and the DHCP server by;~~ varying network parameters of the DHCP client and detecting ~~whether~~ the DHCP client ~~is~~ online according to requirements of ~~a~~ user management strategy.

Claim 4: (Currently Amended) The method of claim 2, wherein ~~in Step 1,~~ for a DHCPDISCOVER or DHCPREQUEST message sent from the DHCP client to the DHCP server, the DHCP relay fills in the ~~at least one field fields~~ associated with the DHCP relay with ~~values a~~

value so that a DHCPOFFER, DHCPACK or DHCPNAK response from the DHCP server to the DHCP client can be sent to the DHCP relay.

Claim 5: (Currently Amended) The method of claim 4, wherein ~~in Step 2, the DHCP relay~~upon receiving a DHCPOFFER, DHCPACK or DHCPNAK response, the DHCP relay extracts and stores the ~~DHCP at least one server parameters~~parameter in the DHCPOFFER, DHCPACK or DHCPNAK response, and replaces the at least one server parameter DHCP-server parameters with the at least one DHCP-relay parametersparameter so that a unicast request to the DHCP server can be still sent to the DHCP relay after the DHCP client has configured an IP address.

Claim 6: (Currently Amended) The method of claim 4, wherein ~~in Step 3, the DHCP relay~~ receives the subsequent DHCP ~~messages~~message for response, and if the ~~fields~~field associated with the DHCP server ~~is~~are contained in the subsequent DHCP message for response, the DHCP relay replaces ~~the values~~a value of the ~~fields~~fields associated with the DHCP server with its IP address.

Claim 7: (Currently Amended) The method of claim 6, wherein the subsequently received DHCP messages~~message~~ for response is a DHCPACK message in a Dynamical Host Configuration Protocol.

Claim 8: (Currently Amended) The method of claim 6, wherein the subsequent DHCP ~~messages~~message for request is a DHCPREQUEST message, a DHCPINFORM message or a DHCPRELEASE message in a Dynamical Host Configuration Protocol.

Claim 9: (New) An apparatus comprising:

a DHCP relay configured to:

modify one or more protocol fields in at least one DHCP message communicated between the DHCP relay, a DHCP client and a DHCP server during an initiation phase of a DHCP interaction at an Application Layer of TCP/IP protocol, so that the at least one DHCP message communicated between the DHCP client and the DHCP server can pass through the DHCP relay, wherein modifying the one or more protocol fields includes:

upon receiving a DHCP message for request sent from the DHCP client to the DHCP server, filling in at least one field associated with the DHCP relay in the DHCP message for request, and

upon receiving a DHCP message for response sent from the DHCP server to the DHCP client, replacing at least one server parameter of a field associated with the DHCP server in the DHCP message for response with at least one relay parameter of the DHCP relay.

Claim 10: (New) The apparatus of claim 9, wherein filling in the fields associated with the DHCP relay in the DHCP message for request is performed such that a DHCP message for response returned from the DHCP server to the DHCP client for responding to the DHCP message for request can pass through the DHCP relay, and wherein modifying the one or more protocol fields further includes:

- extracting and storing, at the DHCP relay, the at least one server parameter of the field associated with the DHCP server in an initial DHCP message for response prior to replacing the at least one server parameter with the at least one relay parameter of the DHCP relay; and

- sending the initial DHCP message for response to the DHCP client.

Claim 11: (New) The apparatus of claim 10, wherein modifying the one or more protocol fields further includes:

- processing, at the DHCP relay, a subsequently received DHCP message for response returned from the DHCP server to the DHCP client;

- determining whether the subsequently received DHCP message for response contains the field associated with the DHCP sever; and

- in response to determining that the subsequently received DHCP message for response does not contain the field associated with the DHCP server, sending the subsequently received DHCP message for response to the DHCP client directly,

- otherwise, replacing the at least one DHCP server parameter in the field associated with the DHCP server with the at least one DHCP relay parameter, and then sending the subsequently received DHCP message for response to the DHCP client so that a subsequent DHCP message for request sent from the DHCP client to the DHCP server can pass through the DHCP relay.

Claim 12: (New) The apparatus of claim 11, wherein modifying the one or more protocol fields further includes:

- receiving, at the DHCP relay, the subsequent DHCP message for request;

- determining whether the subsequent DHCP message for request includes the field associated with the DHCP sever; and

in response to determining that the subsequent DHCP message for request does not include the field associated with the DHCP server, sending the subsequent DHCP message for request to the DHCP server directly,

otherwise, filling in the field associated with the DHCP server with the extracted and stored at least one server parameter, and sending the subsequent DHCP message for request to the DHCP server so that one or more other subsequent DHCP messages for request can pass validity checking by the DHCP server.

Claim 13: (Currently Amended) The apparatus of claim 2, wherein upon receiving a DHCPDISCOVER or DHCPREQUEST message sent from the DHCP client to the DHCP server, the DHCP relay is configured to fill in the at least one field associated with the DHCP relay with a value so that a DHCPOFFER, DHCPACK or DHCPNAK response from the DHCP server to the DHCP client can be sent to the DHCP relay.

Claim 14: (New) A method comprising:

receiving, at a DHCP relay, a DHCP request message sent from a DHCP client to a DHCP server at an application layer of TCP/IP protocol during an initiation phase;

filling in at least one field associated with the DHCP relay in the DHCP request message with data configured to allow a DHCP response message for responding to the DHCP request message returned from the server to the client to pass through the DHCP relay;

transmitting the DHCP request message to the DHCP server upon filling in the at least one field;

receiving, at the DHCP relay, the DHCP response message from the DHCP server; and

replacing, at the DHCP relay, at least one server parameter in a field associated with the DHCP server in the DHCP response message with at least one relay parameter of the DHCP relay.

Claim 15: (New) The method of claim 14, further comprising extracting and storing the at least one server parameter in the field associated with the DHCP server prior to replacing the at least one server parameter.

Claim 16: (New) The method of claim 14, wherein the DHCP server is configured to dynamically assign an IP address to the DHCP client.